3. TRAIN OPERATIONS

The likelihood of right-of-way (R/W) fires caused by trains can be considerably affected by the ways in which locomotive engineers operate their motive and braking power. It can also be affected by train make-up.

Photograph 3-1.
Engineer's Panel

Photograph 3-2.
Engineer's Panel

3.1 Idling and Acceleration

The time of maximum carbon accumulation in both diesel and steam locomotives is when they are idling or operating at minimum power output.

The time of maximum carbon ejection from a locomotive, assuming no mechanical defects, is when power is applied after a period of idling.

Times and places where locomotives are operated at idle or minimum power include: while parked in yards or sidings, while negotiating downgrades, while decelerating for a stop or for a restricted speed zone.

Other than yard exits, the areas most likely to be plagued with exhaust spark fires are where long downgrades change to level or upgrade track and where changing from level to steep upgrade track.

3.2 Deceleration and Downgrades

This section will discuss ways in which fires can be prevented or increased by the manner of handling brakes. Generally speaking, less right-of-way fires occur when dynamic brakes are used, while the use of air brakes tends to increase risk.

“Stretch braking” is accomplished by keeping the locomotives under power while the air brakes are set on the rest of the train. This requires a light and balanced touch on both the throttle and the brake control valve. It is useful for keeping the slack out of the couplings and thus providing a smooth ride without the jarring that sometimes takes place when cars run together. It can also, cause excessive heating of brake shoes and wheels.

“Bunch braking” happens whenever the braking force is applied at the head end of the train and the rear of the train is allowed to run up toward the head. Dynamic and independent air brakes seldom cause fires. Retainers, however, can easily cause overheating of brake shoes and wheels and consequently, fires.

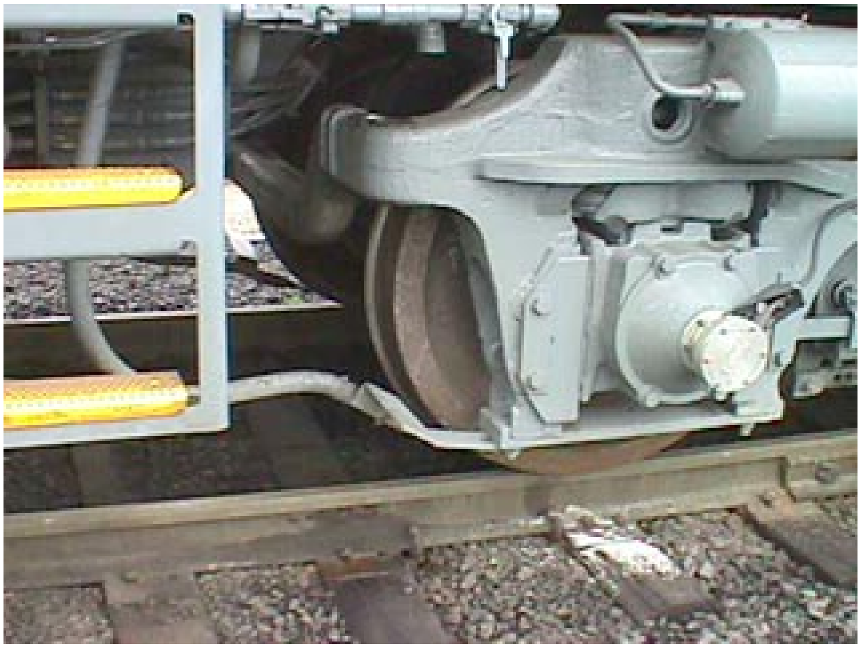
Many times, especially during combination air and dynamic braking, the air brakes are given less than a full service brake pipe reduction. If there is excess friction or slack in the brake rigging (linkage) on any car in the train, a simple release of this minimum set often will not release the brakes on those cars. Stuck or dragging brakes will result. The way to overcome this problem is to increase brake pipe reduction to, or near to, full service for a few seconds before moving the brake valve handle to the release or run position.

Emergency (maximum) application of air brakes will not normally start fires from brake shoes. Although the shoes on the wheels apply maximum pressure, the train is usually brought to a stop in a short enough time that excessive heat is not built up in the shoes. Of course, if any shoes were badly worn or broken at the time, they would be likely to chip, break or wear through and thus cause fires.

3.3 Wheel Slip

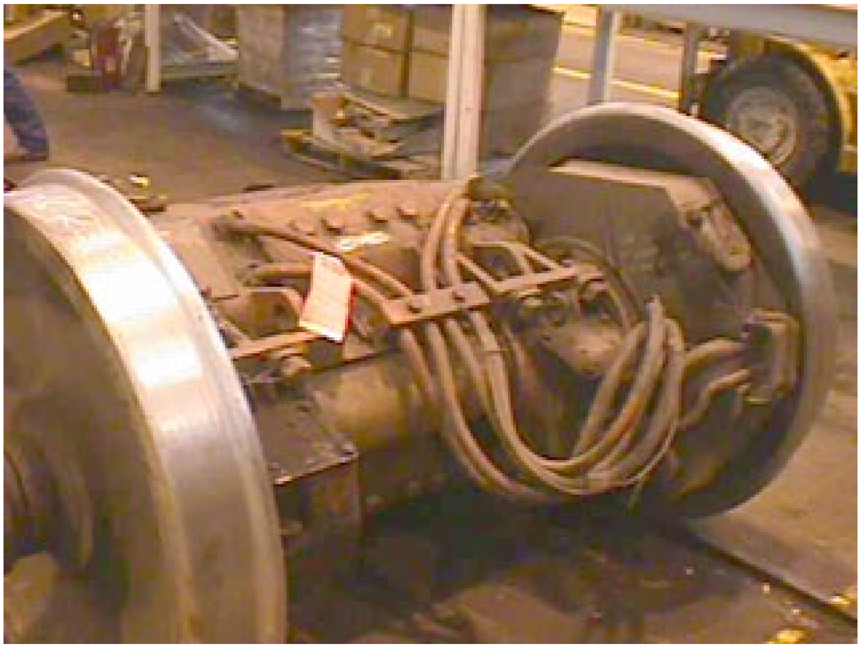
Slippage of wheels against the rail can happen for a number of reasons. These include excessive power applied to locomotive wheels, emergency braking, and retainers, dragging brake shoes, unreleased hand brakes and various malfunctions in the brake system.

These occurrences produce flakes or chips of metal, which can be found along any railroad right-of-way. Wheel slip creates flat shavings that sometimes build up on each other and become welded together by the heat of formation. Rail chips caused by flange wear are usually long, slender and pointed with one side quite rough.



Photograph 3-3.
Sand Dispenser for Traction

Although both types of chips can be found which have been blued by heat they do not often cause fires. Also, the momentum of the train does not throw rail chips; but they fall between the rails.



Photograph 3-4.
Traction Motor

Photograph 3-5.
Filling the Train with Sand

3.4 Train Make-up

The way in which a train is made up will determine, to a large extent, what the engineer can or must do with both the throttle and brakes, especially grades and curved tracks.

The handling of long or heavy trains can be enhanced by adding helper engines, either in the middle or at the rear of the train. Helper engines may be either manned or remotely controlled. Helpers assist both under power and while braking, with either air or dynamic brakes.

3.5 Speed Zones

Speed zones are established for a variety of reasons: grades, curvature, populated areas within grade crossings, conditions of road bed, normal stopping points, etc.

Transition zones are between one speed limit and another. When proceeding from a restricted speed zone to a high-speed zone, full power is ordinarily used. As discussed in this chapter, this acceleration will cause blowing any accumulated carbon out of the stack.

When entering a restricted speed zone from a high-speed zone it is commonly necessary to use brakes. If a relatively small speed change is required, it can often be done with dynamic brakes alone. If a large speed reduction is required, air brakes will usually be necessary even if dynamics are also used.

3.6 Detectors

There are two basic types of detectors used by railroads. Most fire agency personnel are familiar with hot box detectors. The majority of them believe increased numbers of detectors would solve most of their right-of-way fire problems. In the first place R/W fires caused by hot boxes, although common in the past, are quite rare nowadays. The box referred to is the "journal box," which is no longer used in new construction. It has been replaced by sealed roller bearings. Secondly, the detectors are beamed at a narrow band just wide enough to detect incipient journal or axle heat failure which would lead to a derailment. Although brakes shoes are at approximately this height above the rail, they are usually shielded from the detector by the truck frame. Also, when brake shoes start to fail it is usually at the lower end and out of the detector's beam.

Photograph 3-6.
Old Style Wheel Bearing (Journal Box Type)

The other type of detector is the dragging equipment detector. This piece of apparatus is intended to protect trains from derailment and structures such as bridges and trestles from damage.

3.7 Block Signals and Train Orders

It should not be assumed that all trains are controlled by block signals. There are more advanced as well as less sophisticated methods of controlling train movement in use. Some of the more advanced systems, e.g., CTC (centralized traffic control), include a supervisory system to control the block signals, whereas normal block signals are automatic in their operation.

Many hundreds of miles of track are still operated under train orders without benefit of block signals. In these areas the train crews are given written orders assigning them blocks of time to occupy certain stretches of track. Special rules are in effect for the safety of all in case the train is stopped, slowed or delayed from its ordered run.

Since some of these areas present communication problems between train crews and dispatchers, agency inspectors should never attempt to stop a train. Use the numbers through dispatch to stop a train and get the location from the train dispatch. Agency personnel must learn the operational procedures for trains in their area and the locations of sidings that can be used.

3.8 Amtrak (National Railroad Passenger Corporation)

Compared with freight trains, Amtrak operates lightweight, short and high-speed trains. The Federal Railroad Administration (FRA) safety rules and Association of American Railroads (AAR) approved equipment are set to much higher standards because of the life safety involved. This indirectly tends to reduce R/W fire setting potential. Offsetting this trend to some degree are two factors unique to Amtrak.

One factor is the fact that passengers are much more sensitive than most freight cargoes to jolting. Therefore, Amtrak engines tend to use more stretch braking than do freight engineers. This means more air in different places.

The other factor tending to increase fire risks from Amtrak is the carbon accumulation in the silencer (muffler) and the difficulty of cleaning the eductor which will be covered in the exhaust section.